HEARING PROTECTION USE AMONG AIRCRAFT MAINTENANCE TRAINEES IN UNIVERSITY KUALA LUMPUR

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ABSTRACT

Aircraft maintenance workers are at high risk of noise induced hearing loss due to noise exposure during work. Hazards generated from workplace noise in aviation industry such as from operated aircraft engines can affect work effectiveness and increase work stress among employees as well as increase accident rate. The research objectives were to examine the relationships between risk perception, knowledge of noise hazards, knowledge of hearing protection and self-efficacy with hearing protection devices (HPDs) used among students during their industrial training. This quantitative study utilized a questionnaire consisting of 26 questions to measure the relationships between safety risk perceptions, knowledge on noise hazard, knowledge of hearing protection and self-efficacy with HPDs use. A total of 132 questionnaires were distributed and 101 were returned yielding a response rate of 76%. Data collection was carried out using stratified random sampling techniques. The Pearson correlation analysis showed that there were positive and significant (p=0.01) relationships where knowledge on hearing protection was high with r = 0.776, self-efficacy was moderate with r = 0.612, knowledge on noise hazards was moderate with r=0.564, and risk perception was low with r=0.403 towards HPDs use. Multiple regression test showed knowledge on hearing protection was the most influential variable towards HPDs use. All independent variables accounted for 67.7% of the variance in HPDs used. Recommendations and suggestions for future research were also discussed.

Keywords: HPDs use, risk perception, self-efficacy, noise hazard, NIHL

ABSTRAK

Pekerja penyelenggaraan pesawat berisiko tinggi kehilangan pendengaran akibat bunyi bising di tempat kerja. Bahaya kebisingan seperti dari enjin pesawat dapat mempengaruhi keberkesanan kerja dan meningkatkan tekanan kerja di kalangan pekerja. Objektif penyelidikan adalah untuk mengkaji hubungan antara persepsi risiko, pengetahuan tentang bahaya kebisingan, pengetahuan tentang perlindungan pendengaran dan keberkesanan diri terhadap alat perlindungan pendengaran (HPDs) yang digunakan dalam kalangan pelajar semasa latihan industri. Penyelidikan kuantitatif ini menggunakan soalselidik yang terdiri daripada 26 soalan yang mengukur perhubungan antara persepsi risiko keselamatan, pengetahuan tentang bahaya kebisingan, pengetahuan perlindungan pendengaran dan keberkesanan diri dengan penggunaan HPDs. Sebanyak 132 soal selidik diedarkan dan 101 telah dikembalikan memberikan kadar yang dikembalikan sebanyak 76%. Pengumpulan data dilakukan menggunakan teknik pensampelan rawak berstrata. Analisis data menggunakan korelasi Pearson menunjukkan terdapat hubungan yang positif dan signifikan ($p=0.01$) di mana pengetahuan tentang perlindungan pendengaran adalah tinggi dengan $r = 0.776$, efikasi kendiri adalah sederhana dengan $r = 0.612$, pengetahuan tentang bahaya kebisingan adalah sederhana dengan $r = 0.564$ dan persepsi risiko adalah rendah dengan $r = 0.403$ dengan penggunaan HPDs. Ujian regresi berganda menunjukkan pengetahuan mengenai perlindungan pendengaran adalah pemboleh ubah yang paling berpengaruh terhadap penggunaan HPDs. Semua pembolehubah bebas menerangkan 67.7% daripada varians dalam HPDs yang digunakan.

Katakunci: Penggunaan HPDS, persepsi risiko, efikasi kendiri, hazad bunyi, NIHL

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LIST OF ABBREVIATIONS

AMT	Aircraft Maintenance Trainee
ATO	Approved Training Organization
HPDS	Hearing Protection Devices
ICAO	International Civil Aviation Organization
KKLB	Kementerian Kemajuan Luar Bandar
ILO	International Labor Organization
MARA	Majlis Amanah Rakyat
MIAT	Malaysian Institute of Aviation Technology
MRO	Maintenance, Repair and Overhaul
NIHL	Noise Induced Hearing Loss
NRR	Noise Reduction Rating
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act 1994
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
TTS	Temporary Threshold Shift
UniKL	Universiti Kuala Lumpur
WHO	World Health Organization

CHAPTER1

INTRODUCTION

1.0 Introduction

Noise hazards are experienced in aircraft maintenance activities and their surroundings, including airports, aprons, hangars and workshops (Akan, Körpinar, & Tulgar, 2011). In civil aviation industries, aircraft maintenance activities are the noisiest because it deals with many engineering operations such as high pitch sound generated from aircraft engine, auxiliary power unit (APU), traffic movement of ground support vehicles, machines and powered tools (Smedje, Gärtner, Lindgren, Lundén, & Lundgren, 2011).

Some airports have been reported to have experienced level of noise which exceeds the limit of 85dB exposing maintenance workers to high risks of hearing damaged (Anino, Afullo, & Otieno, 2010). 85dB is a permissible exposure limit (PEL) on all workers for 8 hours of noise exposure in one day of work allowed by regulation (Department of Occupational Safety and Health, 2018). The dBA is decibel of sound pressure level used to measure occupational and environmental noise exposures (Neitzel, Fligor, & WHO, 2017).

Besides engineering operations, flight operations also generate noise pollutions during aircraft landing and takeoff. High level of noise disturbs the health as well as efficiency of the workers by increasing the overall work stress of the worker during specific task and performance (Noweir & Zytoon, 2013). Noisy environment also disrupts verbal communication among the workers where communication is one of the key factors in accident prevention.

Noise induced hearing loss (NHIL) is one of noise hazards leading to condition of hearing loss due to prolong exposure to excessive duration and intensity of sound (Henderson, Bielefeld, Lobarinas, & Tanaka, 2011). It is the gradual bilateral sensorineural hearing loss that happen due to excessive exposure with long duration and high intensity of noise (Afiah, Zulkefli, Farhan Bin Rusli, Rahman, & Zulkefli, 2017).

A study made by Noweir & Zytoon (2013) found that noise induced hearing loss (NIHL) among aircraft maintenance workers in Saudi Arabia International Airport caused hearing loss of mild level, moderate or moderately severe hearing loss, however nobody had severe and profound hearing loss. Zero number of severe and profound hearing loss is found because noise induced hearing loss is an irreversible disease where it is a result of prolong exposure and intensity on noise hazards.

In a workplace with constant sound level above 85dB in daily activities such as in airport area, it is common to see accidents happen (Anino et al., 2010). This accident can be prevented if the company improve the hearing safety practices according to recommended practices adapted from hearing conservation program (HCP), for example procedures to monitor noise exposure, implement engineering and administrative controls, educate and motivate employees, conducting a hearing loss prevention program audit, keep proper records and reevaluate the hearing loss prevention program (Morata et al., 2001).

The workers as well as practical student in aviation maintenance where the area of work exceeds the acceptable noise levels should be provided with sufficient training on hearing protection before they start to do the job and should be equipped with

hearing protection devices (Lechlitner Lusk, Ronis, & Kerr, 1995). However, training and equipment provided by company is not a guarantee to safety if the workers or trainees themselves do not possess good application of knowledge, self-efficacy and risk perceptions toward hearing protection use (Razman, 2010).

HPDS use is an element for safety climate in an organization where the high pitch of sound generated from the workplace is one of the hazards exposed to workers (Dov, 2008). According to Arezes & Miguel (2008), HPDS use is an indication of safety behavior in an organization. HPDS use was discussed in health promotion model (HPM) developed by Lusk (1994) where the knowledge on noise hazard, knowledge of the hearing protection, self-efficacy and risk perceptions were important factors identified with HPDS use. The proper use of hearing protection device by the workers could reduce accident rates on NIHL (A. L. Edwards, Milanzi, Khoza, Letsoalo, & Zungu, 2015).

1.1 Background of the Study

In Malaysia, there are regulations to control noise hazard exposures by workers. For example, the Factories and Machinery (Noise Exposure) Regulations 1989, under the Factories and Machinery Act 1967 [ACT 139], states that "the permissible exposure limit (PEL) is 85 dB for Time Weighed Average (TWA) of 8 hours to protect the workers".

Annex 16 of the International Civil Aviation Organization (ICAO) is a document addressing essential international guidelines and standards for noise control at airports. Annex 16 was compiled and developed on the subject of aircraft noise and its surroundings in the form of standards and recommended practices (SRPs) (ICAO,

2017). It is an obligatory requirement for an employer to provide at least one type of hearing protection device in a workplace that exceeds permissible exposure limit (PEL) of 85 dB for an average of eight hours of working per day (Department of Occupational Safety and Health, 2018).

Noise is generally described as a sound that is unpleasant, unwanted, disturbing and is highly subjective feeling (Kam, Kam, & Thompson, 1994). Noise in occupational industries is unavoidable but the risk can be minimized through risk control such as elimination, substitution, engineering control, administrative control and Personal Protective Equipment (PPE) where Personal Protective Equipment is a last chance of safety defense (Goelzer, Hansen, & Sehrndt, 2014). However, the issuance of hearing protection device by employers without supervision and reinforcement will not effectively protect the workers (Maisarah & Said, 1993), (Leinster, Baum, Tong, & Whitehead, 1994).

Hearing protection use is an indicator of safety behavior (Arezes & Miguel, 2008). Safety behavior is an important element in predicting safety climate in an organization where safety climate can increase the percentage of safety actions by workers (Zohar, 2008). Every student of UniKL MIAT has been issued hearing protection devices (HPDS) while undergoing their industrial training. Their risk perception, knowledge on noise hazards, knowledge on hearing protection and self-efficacy towards HPDS use were examined in this research.

1.2 Background of the Organization

Universiti Kuala Lumpur was established in 2002. It is wholly owned by Majlis Amanah Rakyat (MARA), one of agencies under the Ministry of Rural Development

(KPLB). Universiti Kuala Lumpur, also known as UniKL, has fourteen (14) branch institutes located in various states in Peninsular Malaysian. Currently, UniKL boasts a total of 29,043 students from all campuses.

Unlike most engineering faculties in Malaysian universities where the study focuses on pure engineering, UniKL is a leading university in Engineering Technology where the student learning methods is 60% on practical and 40% theoretical compared to pure engineering where 60% is theoretical and 40% is practical (Malaysian Qualifications Agency, 2011). Engineering Technology students are more exposed to hazards and risk of accidents compared to pure engineering students as they spend more time on hands-on learning rather than classroom learning.

Each campus had their own specialization, such as UniKL MIAT specialized in Aviation Technology, UniKL MIMET specialized in Marine Engineering Technology, UniKL MFI in Automotive, Automation & Industrial maintenance, UniKL BMI in Medical Science Technology and Electrical Electronic Technology, UniKL IPROM in Product Design and Precision Manufacturing, UniKL MIIT in Animation and Multimedia and Information Technology, UniKL RCMP specialized in Medical & Allied Health Sciences, UniKL MICET in Quality Engineering & Industrial Logistics, and UniKL MITEC in Food Technology, Chemical & Bioengineering.

UniKL Malaysian Institute of Aviation Technology (MIAT) is an institute specialized in Aviation Technology and Engineering. It currently has about 2000 students in various courses including Engineering Technology courses specializing in Airplane Maintenance, Helicopter Maintenance and Avionics Maintenance. UniKL MIAT has been approved globally by European Aviation Safety Agency (EASA) and

locally by Civil Aviation Authority Malaysia (CAAM) to become an Approved Training Organization (ATO). EASA is the regulating body internationally recognized to monitor the field of civilian aviation safety, whilst CAAM is an agency under the Malaysian Ministry of Transport (MOT) which provides safe, efficient and orderly flow of air transportation, regulation activities in Malaysia.

UniKL MIATis the first Approved Training Organization (ATO) by CAAM in Malaysia. Throughout their study, students of UniKL MIAT (also known as aircraft maintenance trainees) will undergo a six-month industrial training during their last semester of their program. They will be involved in roles like aircraft maintenance technician, aircraft maintenance engineer, technical service engineer, ground support technician and etc. They will work either in the hangar, line station or apron and will be exposed to various hazards and risks as well as risk on noise hazards. Their readiness in terms of knowledge, risk perceptions and self-efficacy towards their safety are vital during the industrial training.

1.3 Problem Statement

Universiti Kuala Lumpur Malaysian Institute of Aviation Technology (UniKL MIAT) has fifty aviation industrial partners to provide students with industrial training. There are approximately two hundred students who will be taking their industrial training every semester. Most of the industrial partners are Maintenance, Repair and Overhaul's (MRO) organizations. MRO is a facility consisting of hangars, workshops and apron for the purpose of aircraft maintenance. All the hangars and workshops involve the use of tools, chemicals, machineries and all these possess risks and hazards.

One of the hazards is noise hazard which can cause irreversible syndrome of noise induced hearing loss NIHL.

The Department of Occupational Safety and Health (DOSH) Malaysia has reported that for the year 2015, 83.7% ofoccupational disease reported and investigated was occupational noise induced hearing loss (NIHL). A study made in Saudi Arabia airport reported that aircraft maintenance workers were at high risk ofNIHL (Noweir & Zytoon, 2013). Prevalence of NIHL showed that there were poor relationships of risk perception, knowledge and self-efficacy among workers with the usage of hearing protection devices (HPDs) (Afiah et al., 2017; Hong, Samo, Hulea, & Eakin, 2008; Lechlitner Lusk et al., 1995).

Low knowledge on noise hazards results in lack of compliance by workers to wear hearing protection devices (Edelson et al., 2009). Studies showed that the relationship between knowledge on hearing protection and HPDs use, where the worker with low knowledge on hearing protection tends to disregard the use of hearing protection devices (Thepaksorn, Siriwong, Neitzel, Somrongthong, & Techasrivichien, 2017).

In Malaysia, a study on noise exposure in a factory found that only 5% of the workers wore hearing protection devices regularly even though hearing protection devices were provided by the organization (Maisarah & Said, 1993). Therefore, poor knowledge on noise hazards and hearing protection towards HPDs used was a more serious concern than the harmful noise itself (Ologe, 2005).

Safety practices among workers towards HPDs use were the outcomes of safety knowledge, safety risk perception and self-efficacy during their study as

undergraduates in universities or as college students, or during training provided by their organizations (Crandell, Mills, & Gauthier, 2004). Student's risk perception towards safety does not begin when they start working. However, risk perception towards noise begins when they become trainees or students before they enter into employment.

A study made among college students in USA found that it was a crucial need to promote healthy hearing behaviors among students as the research found 29% of the students reported working in noisy surroundings during semester breaks and only 14.5% of the students reported wearing hearing protection devices (HPDs). This scenario suggested that 85.5% students were exposed to noise hazards without using ear protection devices (Rawool & Colligon-Wayne, 2008).

Past studies suggested the need to study students' level of knowledge on hearing protection, risk perception and self-efficacy towards HPDs use (Thepaksorn *et al.*, 2017; Arezes & Miguel, 2005; Neitzel & Seixas, 2005). Noise related risk perception among students towards personal hearing protection use should be enforced in their educational stage before they start working with industries.

Hence, this study was conducted to examine the relationships between risk perception, knowledge of noise hazards, knowledge of hearing protection and self-efficacy against hearing protection devices (HPDs) used among students during their industrial training.

In this study, the unit of analysis were the final year students addressed as Aircraft Maintenance Trainees of UniKL MIAT who went for industrial training in MROs (Maintenance, Repair and Overhaul) jobs all around Malaysia. The trainees

faced similar working assignments with experienced workers such as engine and component replacement, aircraft towing, engine ground running and etc.

1.4 Research Questions

This study attempted to answer the following questions:

a) Is noise risk perception related to hearing protection used?

b) Is knowledge on noise hazard related to hearing protection used?

c) Is knowledge on hearing protection related to hearing protection used?

d) Is self-efficacy related to hearing protection used?

e) Which variable is the most dominant among risk perception, knowledge on noise hazard, knowledge on hearing protection, self-efficacy towards HPDs used?

1.5 Research Objectives

This research intended to examine the relationships between factors that lead to compliance towards personal hearing safety to prevent NIHL. The objectives of this study were:

a) To examine the relationship between hearing protection used and risk perception.

b) To examine the relationship between student's level of knowledge on Noise hazard and hearing protection used.

c) To examine the relationship between student's level of knowledge on Hearing protection and hearing protection used.

d) To examine the relationship between student's self-efficacy and hearing protection used.

e) To examine the most dominant variable between risk perception, knowledge on noise hazard, knowledge on hearing protection, self-efficacy towards HPDS used.

1.6 Significance of The Study

The result of this study will provide useful information to the management of the University in understanding the level of knowledge, risk perception and self-efficacy among final year students towards hearing protection used. This information will justify the need to provide additional training, safety motivation and awareness on hearing protection as well as enforcing the use of hearing safety device among students during their industrial training.

Findings on this research will be proposed to the Safety and Health Committee of UniKL MIAT to increase the level of knowledge among students toward personal hearing protection. This helps in controlling and reducing the number of noises related occupational work injuries among the alumni in future.

The results from this study will also help in reducing the number of occupational diseases generated from noise hazards such as noise induced hearing loss among aviation maintenance workers in future through the use of HPDs. Beside promoting safety and health among university students, this research offers feedbacks related to the effectiveness of safety training or hearing conservation program coordinated by University Kuala Lumpur.

This study is part of early occupational disease prevention program where the findings will alert the university students regarding the awareness and importance towards personal hearing safety particularly on HPDs use. The management in the end will establish an effective safety organization and prioritize safety through self-regulation towards students and staff.

1.7 Operational Definition

In this research, there were five variables identified. They were hearing protection used, risk perception, knowledge on noise hazards, knowledge on hearing protection and self-efficacy.

1.7.1 Hearing Safety

According to Oxford Online Dictionary (2012), safety is a state or condition of being protected from or unlikely to cause danger, risk or injury. Encarta online dictionary mentions safety is freedom from danger, protection from or not being exposed to the risk of harm or injury whereas hearing is the faculty or sense by which sound is perceived. Hearing safety therefore is a protection toward worker's hearing anatomy from any harmful object or noise hazard that can cause occupational disease of hearing loss.

1.7.2 Hearing Protection Used

Hearing protection use is an indication of safety behavior in a workplace where the noise exposure in a workplace is constantly above 85dB in average of 8 hours of

working per day (Arezes & Miguel, 2008). Hearing protection use in this study also can be interpreted as PPE used (Neitzel & Seixas, 2005).

1.7.3 Risk Perception

Risk perception refers to worker's judgements and interpretations of hazards exposed to their facilities or environments (Rohrmann, 2008). According to Thepaksorn (2017), risk perception is a variable for safety behavior and to underestimate the objective risk has been shown to be proportional to the probability of accidents.

1.7.4 Knowledge on Noise Hazards

European Agency for Safety and Health at Work (2012) defines hazard as anything that has potential to cause harm. While some dictionary defined hazard as a possible source of danger. Therefore, knowledge related to noise hazard consist of knowing the occupational diseases that can cause harm to hearing system, knowledge related to hearing anatomy and its function, accident prevention and risk control towards noise hazard.

1.7.5 Knowledge on Hearing Protection

Knowledge on hearing protection is an outcome of good safety training, both in theoretical aspects and practical aspects particularly in usage of hearing protection device to prevent NIHL. Good usage of PPE such as safety hearing device is an indication of safety behavior where in this context of research, HPDS usage is an indication of good safety behavior and safety climate (Arezes & Miguel, 2005).

1.7.6 Self-efficacy

According to Flammer (2015), self-efficacy is a person's belief on their potential to achieve something. Self-efficacy can show the way on how people's think, feel, behave and self-motivation level. The source of self-efficacy is a person's experiences activated through either cognitive processes, motivational processes, affective processes or selection processes (Bandura, 1994). A high level of self-efficacy improves human performance and well-being as they approach the problem as a challenge instead of avoidance. Training effectiveness has been proven where it is related to self-efficacy. New students who are going for industrial training could adapt to their work and increase job performance through self-efficacy (Grau, Martínez, Agut & Salanova, 2002).

1.8 Scope of the Study

The study was conducted at several aviation companies employing UniKL MIAT students as industrial trainees. The companies involved are MRO (maintenance, repair and overhaul) companies which perform engineering maintenance on the aircraft. This study focused only on final semester students in mechanical and avionics trades from diploma to degree levels. The nature of their internships involved high pitch sound generated from aircraft engine, ground running and test, maintenance at apron and line maintenance, hangar and workshops.

1.9 Organization of the Thesis

This thesis consisted of five chapters. The first chapter explained the introduction and background of the studies, problem statements, research questions,

research objectives, significance of the study, scope of the study, definition of key terms and organization of the thesis.

Chapter two described the review of literature on concepts related to hearing safety, hearing protection used, hearing conservation program, risk perception, knowledge on hearing protection, knowledge on noise hazards and self-efficacy.

Chapter three proposed the methods and techniques utilized in this study. The discussion included the research design, research instruments, data collection procedures, sampling and population techniques. Chapter four is a research finding on the analysis of data based on survey conducted using instruments mentioned in Chapter three. Chapter five is a discussion of the result and findings from chapter four, limitation of study, recommendation and conclusion.

1.10 Summary

This chapter presented the background of the study and provide the setting for the problem statement. Subsequently, the research questions and research objectives were set to guide this paper. The significance and scope of the study were also discussed.

CHAPTER2

LITERATURE REVIEW

2.0 Introduction

This chapter described the concepts of hearing protection, definition of noise and sound, how the noise disturbs the ear and cause damage, then followed by the discussion on hearing protector, their rating, requirement by regulation, and how HPDs usage can prevent NIHL. Next section is discussing about empirical studies on used of hearing protection, the disadvantages of using HPDS, attitudes of the workers towards HPDS and effectiveness of HPDS. Then next section is discussing about first independent variable which is risk perception, empirical studies on risk perception and risk perception towards hearing protection use. The next section is discussed about knowledge on noise hazards, knowledge on hearing protection towards hearing protection used. The last independent variable is discussed about self-efficacy, empirical study of self-efficacy towards hearing protection used. This chapter concludes by discussing the research framework.

2.1 Hearing Protection Device Use (HPDs Use)

Noise is the primary cause of occupational hearing loss (Kim, 2010). According to Basner (2014), noise is an unwanted sound, one of physical hazards where it is the most pervasive occupational health problems. Sound is changes of pressure in a medium of air caused by frequency and vibration. The change of pressure produces waves emanating away from the vibrating source (Occupational Safety and Health Administration, 2002). The sound waves enter the ear canal and vibrate the ear drum.

This will move the tiny chain of three bones in our middle ear which are ossicles-malleus, incus and stapes and the last bone will knock the membrane window of the cochlea and move its fluid in the cochlea. This will then trigger response in hearing nerve. One-time exposure to high intense sound or continuously loud sound can damage the hair cell (sensory cells) inside the cochlea and caused noise induced hearing loss (Basner et al., 2014).

Hearing protection such as ear muff, ear plug and ear cap can help reducing the intensity of noise (Afiah et al., 2017). Level of noise filtration is determined thru Noise Reduction Rating (NRR) where it represents the ability of the protectors under laboratory conditions to reduce noise. The employers should evaluate the hearing protectors periodically to suit the working condition. (Occupational Safety and Health Administration, 2002). A study conducted with in an industry with high NIHL incidence, found the employers did evaluate hearing protector attenuation but only use manufacturer specifications without knowledge of occupational and environment noise levels and without adjustment of NRR rating (Daniell et al., 2002). During high noise exposure, it is unclear to obtain the amount of attenuation where NRR stated on earmuff base on laboratory measures bear little relation to actual attenuation achieved by workers in actual field (Neitzel & Seixas, 2005).

Hearing protection is an obligatory requirement to be fulfill by employers when the noise exposure in the workplace is above 85dB or above for duration of 8-hour TWA (time weighted average). The employers must provide personal protection equipment for the hearing protection of at least one variety of hearing plug and one variety of hearing muff (Occupational Safety and Health Administration, 2002). In

Malaysia, the regulation is enforced under the Noise Regulation under The Factories and Machinery (Noise Exposure) Regulation 1989 together with the Guideline for Control of Occupational Noise 2005 issued by Department of Occupational Safety and Health (DOSH), Malaysia. This guideline is act as practical guidance to employers on ways to comply with and implementing the requirements of the Factories and Machinery (Noise Exposure) Regulations 1989 (Rahman et al., 2005).

The best solution on prevention of NIHL is by engineering control where the source of noise is reducing by the way of redesigning the machine or the process that produce the noise (Rahman et al., 2005). But this require a management commitment in term of investment in monetary aspects. Hearing protection device (HPDS) is the last defense mechanism in method of controlling noise exposure to the worker beside engineering control to reduce noise level and administrative control to reduce length of exposure to the worker. Due to economic and technical reasons, hearing protection devices are considered as the most practical solution to protect the worker from noise hazards (Maisarah & Said, 1993). Even though hearing protector can reduce the risk of NIHL and other occupational hearing diseases, some researchers doubting the HPDS towards hearing conservation except with proper supervision and reinforcement of use (Lofgreen, 1982). The comfortless of hearing protection is part of the problem where it will be less effective and tend to be worn in short time (J. Edwards, 2003).

One empirical study conducted for 356 noise exposed worker in Malaysia, 20% of them had lost possession of that devices and only 4% is fully compliance with the use of HPDS regularly. Among the reason of this result are communication interruption during high noise level, uncomfortable and getting used in noisy environment

(Maisarah & Said, 1993). NIHL prevention and legislation in South East Asia countries had often poorly implemented and enforced where the worker ignore the use of HPDS (Razman, 2010). Most of empirical studies had shown most of the noise exposed worker lack in commitment and compliance towards use of HPDS (Neitzel & Seixas, 2005). It has been established that there is a link between HPDS used and level of basic knowledge on HPDS used, risk perception and self-efficacy which also demonstrated the poor of basic understanding and attitudes increase the risk on NIHL (Afiah et al., 2017). This study will investigate relationship between hearing protection used with four independent variables which are risk perception, knowledge on noise hazards, knowledge on hearing protection and self-efficacy.

On this study hearing protection used will be used as a dependent variable taken individual self-report as measure. From empirical studies, it is concluded where self-report on HPDS use as reliable measure from previous study by Lusk et al. (1999) and Seixas et al. (2001).

2.2 Risk perception

Hearing protection devices are temporary solution in preventing occupational hazard related to noise due to factors of viability and practicability issues compared to engineering control for example which require bigger investment of machines and administrative control that requires more workers to create work shift. But unless the worker wears the HPDs continuously, the benefit will be very high (Neitzel & Seixas, 2005).

Previous studies pertaining HPDs used was not correlated with reported increased sales of HPDs but the number of NIHL claimed on compensation also

increase (Kim, 2010). Therefore, issuance of HPDs doesn't guarantee the usage of HPDs by the worker unless there is a risk perception developed among the worker about noise hazard.

Some studies for example Maisarah (1993) had suggested that employers must enforce the usage of HPDs, but it is very doubtful because this enforcement will not change the worker's perception towards noise hazard, and this will result wearing the HPDs wrongly or not fit properly (Arezes & Miguel, 2005).

Empirical studies have concluded that individual worker perception are significant predictors of safety behavior as well as HPDS use (Arezes & Miguel, 2005). The important of risk perception especially towards noise hazard can influences worker's behavior and attitudes in a way of preventing noise exposure either by avoidance or by using hearing protection (Arezes & Miguel, 2008).

It is also suggested that individual risk recognition and risk perception to be included in OSH safety promotion program as well as incident prevention program (Thepaksorn et al., 2017). Hence, risk perception can play significant role as predictor of safety behavior concerning the use of HPDs and should be part of hearing conservation program in organization.

This study is important to determine the relationship between risk perception toward HPDs used. This also because the risk itself doesn't only depends on certain variables such as knowledge on hearing protection, self-efficacy and knowledge on noise hazards, in fact risk perception is the most significant variable among those (Arezes & Miguel, 2008). The risk perception should at first introduce and promote to the aviation worker since they were as student.

2.3 Knowledge on Noise Hazards

Noise hazard risks are quite distinctive compared to other type of hazard where noise hazard is invisible and not explicitly dangerous where the damage process does not show a clear indication of its consequence unless the noise level is too high such as gun explosion (Laird, 2011). Knowledge of the worker toward the noise hazards is an awareness element towards the hazards itself such as noise sources and it is an essential element in preventing NIHL and the key to create safety perception of the worker toward HPDS used (Williams, Purdy, Storey, Nakhla, & Boon, 2007).

Empirical studies show most of worker with NIHL disease had been worked without sufficient knowledge and training regarding noise hazards in construction industries (Leather, 1988). A study made by Afiah (2017) in automotive industries in Malaysia found only 21.7% of respondents had satisfactory level of knowledge with regard to noise induced hearing loss where most of them had experience above 10 years in service with industry.

Knowledge about noise is intended to quantify the workers' perception about the noise exposure phenomena, including the potential effects and workers' workplace requirements regarding noise exposure. Knowledge on noise hazards was related to the identification of workers' workplace noise exposure risk (Arezes & Miguel, 2006).

The study was investigating either the workers are not exactly aware of the risk they are exposed to. Although there is a need to use HPDs in all the analyzed workplaces, some of the workers see their workplaces as not significantly dangerous, therefore, a place where it is not necessary to use HPDs. Some authors, for example Berger (2003), suggest that an additional issue in the HPDs use is the enforcement of

utilization. These authors noted that the achievement of successful HPDs use is only obtained if everyone who enters a designated noise area uses a HPDs and that companies must consider this policy as absolute and that must be frequently enforced but the idea was rejected as the workers feel they are being observed, they will use HPDs, but it is very unlikely that they will use HPDs properly if they know they are not being observed.

It is concluded that knowledge towards noise hazards will increase likelihood in satisfactory knowledge on safety and increase likelihood to practice HPDs use during work with strong correlation on both variable. Previous study by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed knowledge on noise hazard had strong correlation towards HPDs use.

2.4 Knowledge on hearing protection

Knowledge on safety, beliefs and values shared among the worker are the reflections of the importance of psychological, social and organizational factors and safety culture that being emphasized in organization (Grau et al., 2002). Outcome of good knowledge on safety especially on personal protective equipment PPE contribute to good attitude in safety (Thepaksorn et al., 2017).

The real challenge on achieving goal of safety is not lies on how advance the engineering control or protection devise or legislative safety solution but the knowledge and awareness of the worker towards the use of hearing protection itself (Widén, Holmes, Johnson, Bohlin, & Erlandsson, 2009). Sufficient training on hearing

protection will cultivate the safety attitudes and safety behavior towards hearing protection device used (Grau et al., 2002).

Empirical study made to construction worker found that even after hearing conservation program, only 75% of the worker reported using their HPDs and it was found difficult to change future intention to wear HPDs among construction worker (Neitzel & Seixas, 2005).

The industrial Noise and Vibration Centre in UK 2009 identified knowledge in safety is the first element in best practice of noise control (HaSPA (Health and Safety Professionals Alliance), 2012). Part of effective hazard management consist of management toward safety climate or perceptions towards safety, procedure and practice related to safety such as wearing the PPE, whereas noise hazard management is particularly important because the nature of noise hazard is not visible and NIHL occurs gradually then cause no motivation to the worker to do something about it (Leinster et al., 1994). Sufficient training by employers towards safety knowledge will encourage the worker's attitude and behavior toward preventing the NIHL (Laird, 2011).

Knowledge about hearing protection is linked with workers' perception about the existing HPDs and procedures for its use and selection. The study by Arezes & Miguel (2006) showed clear indication that workers were not familiar enough with the proper fitting and use of HPDs without proper training specifically on HPDs use. This fact is even more important if we consider that one of the major problems attributed to the HPDs inefficiency is the bad fit of the devices Toivonen et.al (2002), which could totally compromise the attenuation of the devices. It should be noted that it is legally

and technically recommended that all HPDs users should be instructed on the fitting procedures of HPDS so that the workers will have any kind of training or other type of instructions regarding the correct use and fit of their hearing.

It is concluded that knowledge towards hearing protection will increase likelihood to practice HPDs use during work with strong correlation on both variable. Previous study by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed knowledge on hearing protection had strong correlation towards HPDs use.

2.5 Self-efficacy

According to Flammer (2015) self-efficacy refers to one person's belief in their capability in doing certain task. Self-efficacy was a strong predictor in HPDs used as discussed in previous study (Pedro M. Arezes & Miguel, 2005), (Thepaksorn et al., 2017), (Iii et al., 2006) and (Lechlitner Lusk, 1994). It is a strong predictor for hearing protection use where it was found highly correlated in experiment by Lusk et.al (1994) on test of the health promotion model as a causal model of construction workers' use of hearing protection.

According to Arezes (2005), self-efficacy in the use of HPDs was identified as the main predictor for HPDS use where based on obtained results, HPDs use promotion is more effective if focused to workers' perceived self-efficacy rather than in othertype of intervention, such as, a strictly enforcement of the HPDs use with the consequent disciplinary.

A study made with construction workers by Neitzel and Seixas (2005) self-efficacy was also important predictors towards HPDs use and were associated with HPDs use in at least one of the regression models in their findings.

Self-efficacy refers to a person's belief in their capability to successfully perform a particular task where in this context of research is HPDs use. According to Purdy (2005) self-efficacy is an important predictor of hearing protector use and is likely to also determine whether people use other means to reduce their noise exposure, such as engineering or alternative solutions to reduce noise levels at the source.

A study made by Arezes & Miguel (2006) on self-efficacy was the lowest results on the workers and it was related with the recognition of the correct use of HPDs. Self-efficacy dimension is related to workers' perception about their confidence and capabilities to use HPDs appropriately and effectively in their work settings. An important result of the regression that should be emphasized is the role of self-efficacy on the regular use of HPDS. This variable presents, a standardized coefficient (β) of 0.778. This result shows that self-efficacy (i.e., the way workers perceive that HPDS can protect them efficiently and that they are able to use it in a proper way), seems to explain most of the variability observed in HPDS regular use. self-efficacy more related with the perception of workers regarding the ability to use the HPDS efficiently. This conclusion could be of important value, because it shows that workers must be aware that they could carry out their job and, simultaneously, use their HPDS efficiently. If workers consider that HPDs are not useful or are harmful (i.e., 'inefficient'), they will certainly reject it. Therefore, in order to promote HPDs use it is very important that workers recognize that there is a great diversity of HPDs types (including HPDs with

electronic features) that could solve some of their perceived problems, such as the incapacity to hear workplace machines.

In this research, self-efficacy is a belief in student's ability to use HPDs correctly. It is an important variable in determining HPDs usage whether the students use other way to reduce their noise exposure such as reducing the noise intensity by getting away from the noise source or engineering control or other alternative solution. Therefore, all conclusion from previous study by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed self-efficacy has significant correlation towards HPDs use.

2.6 Summary

All four independent variables (risk perception, knowledge on noise source, knowledge on hearing protection and self-efficacy) and the dependent variable, usage of hearing protection devices were discussed. The research framework for this study was developed based on the literature review and discussed in the following chapter.

CHAPTER3

METHODOLOGY

3.1 Introduction

This chapter discussed the research framework and research design, measurement instrument for dependent and independent variables, population and sample, data collection instruments, sources and proposed procedures for data analysis. The methods and techniques employed for data collection and analysis were mentioned.

3.2 Research Framework

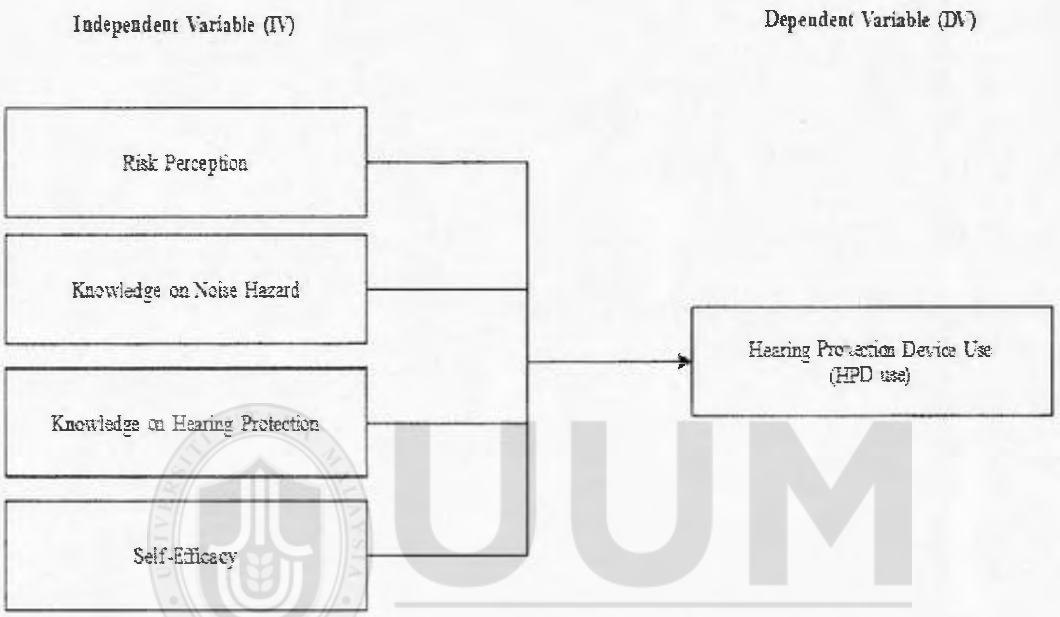
A research framework showed the relationships between the dependent variable and independent variables (Uma Sekaran, 2006). This study investigated the relationships between risk perception, knowledge on noise source, knowledge on hearing protection, self-efficacy as independent variables with hearing protection device used (HPDs used) as dependent variable. The research framework in this study was proposed based on Arezes & Miguel (2005) and depicted in Figure 3.1.

3.3 Research Design

This was a quantitative research aimed to examine the relationships between risk perception, knowledge on noise hazard, knowledge hearing protection and self-efficacy with hearing protection used amongst the final year students of UniKL MIAT. The independent variables were the predictors that influenced the hearing protection used by the trainees. Hearing protection used was a strong indication of safety behavior

as suggested by Arezes (2008). A survey method was utilized to measure the relationships between the independent variables with the dependent variable.

Figure 3. 1: *Research Framework*



3.4 The Population of the Study

The population in this study included all final year students of Universiti Kuala Lumpur working in aviation industries as practical students in several MROs (Maintenance Repair Overhaul) in Malaysia. A total of 200 students from UniKL MIAT campus were included in this study. According to Krejcie & Morgan (1970), the sample size in this study, where the total number of practical students undergoing their internship training was 200, was 132. Table 3.1 showed Krejcie & Morgan's (1970) table for sample size determination for a given population size.

Table 3. 1

Sample size for a given population size

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

3.5 The Sampling Procedure

Sampling is the process of determining a sufficient number of respondents from a population. This study employed random sampling where everyone in the population

had an equal chance of being selected as a respondent and to represent the population (Zikmund, Babin, Carr, & Griffin, 2013).

The sampling technique used for this research was the stratified random sampling technique. The population included all students who work in high noisy operations such as from helicopter maintenance, turboprop aircraft operation, hangar and line maintenance activities. 132 students were chosen from 200 who were working and exposed to loud noise from aircraft and exposed to higher risk on NIHL. Every n^{th} and subsequently n^{th} +1 students were chosen from the list of practical students in every company where there were UniKL practical students.

3.6 The Research Instrument

The questionnaire was divided into 5 sections. Section 1 covered the demographic profiles of the respondents. Section 2 represented the dependent variable. Section 3, 4, 5 and 6 were items to measure the independent variables. Section 3 consisted of 6 questions to measure the risk perception towards noise hazards, while section 4 comprised of 5 questions to measure the knowledge towards noise hazard. Section 5 presented 5 questions to measure the knowledge about hearing protection and section 6 listed 8 questions to measure self-efficacy. The variables were measured using 6-point Likert scale. The dependent variable, HPDs used, consisted of 2 questions on percentage of HPDs usage on daily basis and previous two weeks during high noise. HPDs usage self-report measure was adapted from Iii *et al.* (2006).

Likert scale has been used to measure each item on questionnaires. A Likert scale is a response scale easy to interpret and analyses by using SPSS software. For this research, a six scale item has been chosen and adapted from Lusk et.al (1995). The

respondents were asked to answer the questionnaire item on six-point Likert scale from strongly disagree which is equal to 1 point to strongly agree which equal to 6 points. For risk perception items, respondents were asked to rate a six-point Likert scale from no risk at all which is equal to 1 point to very high risk which is equal to 6 points.

There were items in the questionnaire which were positively and negatively worded. These needed to be addressed before the responses were coded and analysed. Positively worded items were items that were arranged so an agreement with the item represents a comparatively high level of the aspect being deliberated.

For example, a question such as "any high noise level can be dangerous", rated on six-point Likert scale of 1 to 6, where 1 = strongly agree, 2 = agree, 3 = less agree, 4 less disagree, 5= disagree and 6 = strongly disagree. This question was considered positively worded, because high noise level is dangerous. The reason of six-point Likert scale was used rather 5-point Likert scale is to eliminate the tendency for participants to select the middle point of Likert scale.

Negatively worded items were included so that an agreement with the item represented a comparatively low level of the aspect being deliberated. For example, a question such as "Noise in my workplace is not dangerous" rated on six-point Likert scale of 1 to 6, where 6 = strongly agree, 5 = agree, 4 = less agree, 3 less disagree, 2= disagree and 1 = strongly disagree. This item was negatively worded, because an agreement or strong agreement showed a low level of knowledge of the participants. In this research, the set of reverse scored items were shown in Table 3.2. All reversed score items had been recoded using SPSS before analyzing all the data.

Table 3. 2:

Items Identified as Reverse Scored Item

Variables	Number of Questions	Reverse-scored Item
Hearing Protection Used	2	0
Risk Perception	7	0
Knowledge on Noise Hazards	5	1
Knowledge on Hearing Protection	5	1
Self-Efficacy	8	4

Questionnaires were designed to gather information from the respondents about the hearing protection device use, risk perception, knowledge towards noise hazards, knowledge about hearing protection and self-efficacy. The questionnaire for the survey was adapted from Arezes & Miguel (2005) which items reported a reliability value of at least 0.7 (Pedro M. Arezes & Miguel, 2005). The reliability value of 0.7 was considered to be acceptable as suggested by Greenspoon and Saklofske (1998) and Spector (1992).

3.7 Pilot Study

A pilot study is a small-scale trial run of a larger survey. It was conducted before the larger survey was carried out. The purpose of this pilot study is to identify potential problems that could be faced by the researcher. This study is also used to estimate the response rate, questionnaire completion time, consistency and to improve question design, language design and clarity of the question. Total 25 respondents were involved in this pilot study resulting a Cronbach's alpha value which reported a high and acceptable value of α= 0.923.

3.8 Data Collection Procedure

Questionnaires were distributed to a total of 132 students who did their industrial training in high noisy operations such as from helicopter maintenance, turboprop operation and line maintenance in several companies all around Malaysia. The researcher emailed the questionnaires and attach a cover note with instructions to the students. The students were briefed on the purpose and objective of the survey before they started their practical training. The trainees were given three days to complete and to return the questionnaires. After all the questionnaires were collected, they were keyed into the SPSS and analyzed.

3.9 Analysis of The Data

The collected data were coded and analyzed to answer the research questions and achieve the research objectives. To do the analysis, the Statistical Package for Social Sciences SPSS version 20.0 was used. Data screening was carried out to make sure all data answered in questionnaire were keyed in correctly.

3.9.1 Reliability of the Instruments

In the SPSS, the reliability of the data will be tested on the value of Cronbach alpha. This is to make sure the data is consistent and stable with the value of at least 0.7. The higher the value of Cronbach's alpha near to 1 the more consistency in the data. The Cronbach's Alpha values are as per table below where the value of 0.7 for Cronbach's Alpha were found to be acceptable by Nunnally (1994) for social science research.

Table 3. 3

Cronbach's Alpha Measures (Nunnally, 1994)

Cronbach's Alpha	Reliability
0.8 and above	Good
0.7	Acceptable
0.6 and below	Poor

3.9.2 Descriptive Statistics

Descriptive statistics will be used to study the demographic of the respondents such as gender, age, study trade and education level. Itis essential information to know the population of respondents. These data were analyzed using descriptive statistics to discover the mean and standard deviation. The Pearson correlation can be found also through SPSS to investigate the significance of relationship between all independent and dependent variable through linear bivariate relationship. While the direction, degree and strength of relationship between independent and dependent variables can be analyses through multiple regression analysis. Multiple regression takes compounding effect of the independent variables which cause the test is more rigorous compared to Pearson correlation.

3.9.3 Correlation Analysis

The purpose of Pearson correlation is to determine the significant of relationship and to test linear association between two variables. It is unit less where the values are range from -1 to I and 0 indicates no correlation. The closer the value of correlation to 1 the higher positive association between both variables. The closer the

value of correlation to -1 the stronger negative association. Table 3.4 below shows the interpretation of correlation size according to Mukaka (2012).

3.9.4 Multiple regression

Multiple regression is the process to access and levels the relationship between independent and dependent variable (Umar Sekaran, 2003). The multiple regression can show an analysis of the data by summarizing the most important predictors between all predictors towards the prediction of dependent variable. It is also used to predict one variable performance from other variable performance and give out the most significant performance of variable. Multiple regression analysis was used to answer the research question number 5 to find out which variable was the most dominant towards HPDs use.

Table 3. 4

Correlation Interpretation Table (Mukaka, 2012)

Size of Correlation	Interpretation
.90 to 1.00	Very high positive correlation
.70 to .90	High Positive correlation
.50 to .90	Moderate Positive correlation
.30 to .50	Low positive correlation
.00 to .30	Negligible correlation

3.10 Summary

This research is based on only collected data from questionnaires answered by respondent without doing any qualitative approach. There were total of 101 respondents who responded to this questionnaire. This process of collecting data also

important in getting the research question to be answered in order to know whether it have strong relationship or weak relationship between variables.

CHAPTER4

RESEARCH FINDINGS

4.1 Introduction

This chapter presented the findings and results from the analysis of data collected by using software Statistical Package for the Social Sciences (SPSS) version 20. Data were analysed using reliability analysis, descriptive analysis, correlation analysis and regression analysis. The respondent's demographic data were analyzed using descriptive analysis. Meanwhile Pearson correlation was used to examine the relationships between all independent variables and the dependent variable. Multiple regression analysis was used to study the most dominant independent variables towards the dependent variable.

4.2 Response Rate

A total of 132 questionnaires were distributed to all respondents who were undergoing their practical industry Maintenance Repair and Overhaul (MRO) companies in Selangor, Malaysia. The respondents have been briefed regarding the purpose of this study and were given ample time to complete the questionnaire for three days. The questionnaires were collected after the third day by the researcher in their workplaces.

The number of questionnaires which were returned were 101 sets with a response rate of 77%. Table 4.1 below showed the response rate on the questionnaires. 77% was an acceptable rate as suggested by Fincham (2008).

Table 4. 1

Response Rate

Items	Total	Percentage(%)
Distributed Questionnaires	132	-
Collected Questionnaires	101	77
Unreturned Questionnaires	31	23

4.3 Respondents' Demographic Background

Respondent's demographic details were described as per in Table 4.2 below.

Table 4. 2

Demographic Characteristic of the respondents

Demographics	Frequency	Percentage
Gender		
Male	88	87.1
Female	13	12.9
Trade		
Mechanical	44	43.6
Avionics	57	56.4
Age		
20 years and below	51	50.5
20-24 years old	46	45.5
25-29 years old	4	4
Education		
SPM	85	84.2
Diploma	16	15.8
Ethnicity		
Malay	92	84.2
Chinese	5	5

Indian	4	4
Level of Study		
Degree	17	16.8
Diploma	84	83.2

Table 4.2 shows the majority of respondent is Diploma students which is 83.2% and Degree students is only 16.8%. This can show that the result of the study was influenced by diploma student who's involved in operational work rather than degree students who might be involved partially in office work.

The result also shows that this study was influenced mostly by male student where 87.1% is male and 12.9% female. There were 88 males and 13 females out of 101 respondents. Therefore, the result was in majority derived from male's respondent perception.

For age demography most, respondents were under 25 years old. This is due to most of the respondents were either Degree or Diploma students. Only 4 respondents were above 25 years of old age.

In terms of ethnicity, majority of respondents were Malay which is 84.2% and 92 out of total 101 respondents. Only 5% is Chinese and Indian is 4%. Most of the Malay is because University Kuala Lumpur is a subsidiary of MARA and most UniKL students have the eligibility to be sponsored under MARA.

The analysis on education background shows that majority of students had SPM as their qualification which is 84.2 % and Diploma qualification is 15.8%. This gives high correlation with high number of Diploma student versus Degree students as discussed in previous paragraph before.

4.4 Reliability Analysis

Reliability analysis is one way to check the internal consistency of each factor (Nunnally & Bernstein, 1994) and for this study it is measured through Cronbach's alpha techniques. The closer the value of alpha Cronbach's to 1 the better it is and over 0.80 are good, 0.7 is acceptable and 0.6 is poor. (U. Sekaran & Bougie, 2016). For this study the value ofCronbach's alpha is considered good which are between 0.77 to 0.95 for each variable.

The Cronbach's alpha for all variables were HPDS used (α = 0.794), Risk Perception (α = 0.953), Knowledge on Noise Hazard (α =0.774), Knowledge on Hearing Protection (α =0.933), and Self-efficacy (α =0.893). The value of Cronbach's alpha for each item is presented in table 4.3 below.

Table 4. 3

Reliability Coefficients for Each Dependent and Independent Variables

Measurement	Cronbach's Alpha (α)	No. of Item
HPDs Used	0.794	2
Risk Perception	0.953	6
Knowledge on Noise Hazard	0.774	5
Knowledge on Hearing Protection	0.933	5
Self-efficacy	0.893	8

4.5 Descriptive Analysis

In this study, the descriptive analysis included mean and standard deviation values for each dependent and independent variable. The results were reported in table 4.4 below. The mean value is a central tendency of measurement that can show the

overall picture of data set (Sekaran & Bougie, 2016). It is the average value of data set and coupled together with the value of standard deviation. The standard deviation describes in term of how much quantity differ or spreader from the mean value of the data. By looking at value in Table 4.4, risk perception had the highest mean value of 5.6 and SD= 0.57 compared to other variables.

Table 4. 4

Descriptive Statistics for Main Variables

Variables	Mean	Std. Deviation	N
HPDs used	5.2	.95	101
Risk Perception	5.6	.57	101
Knowledge on Noise Hazard	5.3	.60	101
Knowledge on Hearing Protection	5.2	.75	101
Self-efficacy	5.5	.52	101

4.6 Pearson Correlation Analysis

The purpose of using Pearson correlation analysis is to determine the linear correlation between two variables. Table 4.5 shows the result of correlation analysis between dependent and independent variables, and independent variables with independent variables.

Table 4.5 shows the correlation between all main variables. The result shows that all independent variables have between low positive correlation to high positive correlation and significant relationship with HPDs used according to Mukaka (2012). The independent variable of knowledge on hearing protection shows a significant, high positive correlation towards HPDs used with r = 0.776, p=0.01.

Secondly, the independent variable for self-efficacy shows significance and medium positive correlation towards HPDs used, with r= 0.612, p=0.01. Third, the independent variable for knowledge on noise hazard shows significant and medium positive correlation towards HPDs used with r = 0.564, p=0.01. The lowest value between all independent variable is risk perception shows significant and low positive correlation towards HPDS used with r= 0.403, p=0.01.

Table 4. 4

Pearson Correlation Analysis

	HPDs use	Risk Perception	Knowledge on Noise Hazard	Knowledge on Hearing Protection	Self-efficacy
HPDs use	1				
Risk Perception	.403**	1			
Knowledge on Noise Hazard	.564**	.827**	1		
Knowledge on Hearing Protection	.776**	.743**	.852**	1	
Self-efficacy	.612**	.888**	.902**	.917**	

N: 101 P= 0.01

**Correlation is significant at the 0.01

4.7 Multiple Regression Analysis

Table 4.6 shows that the overall regression model was significant (Sig: F change=0.000, $p < .001$, R^2=.677). The predictors risk perception, knowledge noise hazards, knowledge hearing protection and self-efficacy account for 67.7% of the variance in HPDs used. R square is the measure of the amount of variance in the dependent variable that the independent variable or predictors account for when taken as a group. The table 4.6 shows that risk perception, knowledge on noise hazard and self-efficacy were not significant in predicting HPDs use. However, knowledge on hearing protection indicates the most significant variable that predict HPDs use.

Table 4. 5

Multiple Regression Results on HPDs use

Variables	Standard error	βeta	t. value	Sig.
Risk Perception	.235	-.234	-1.673	.098
Knowledge Noise Hazards	.220	-.069	-.499	.619
Knowledge Hearing Protection	.204	1.256	7.767	.000**
Self-Efficacy	.432	-.269	-1.122	.265
R square				0.677
Sig. F change				0.000***
F Value				50.312

Note:

**P<0.001, Sig =Significant

Dependent Variable: HPDs_Use

Predictors: Self_Efficacy, Risk_Perception, Knowledge Noise Hazards, Knowledge Hearing Protection

4.8 Results

The result from Pearson correlation coefficient test in table 4.5 assesses the relationship between independent variable (risk perception, knowledge on noise hazard, knowledge on hearing protection and self-efficacy) and dependent variable which is HPDs use.

(a) Research Question 1

Is there any relationship between risk perception of the trainee towards and hearing protection used?

Table 4.5 illustrates that there is significant and low positive correlation towards HPDS used with r= 0.403, p<0.01, N=101. Thus, the relationship is weak between risk

perception and HPDs use by 40.3%. It means increase in HPDs use were low correlated with increase in risk perception by the trainee.

(b) Research Question 2

Is there any relationship between knowledge on noise hazards of the trainee towards and hearing protection used?

Table 4.5 illustrates that there is significant and medium positive correlation towards HPDs used with r= 0.564, p<0.01, N=101. Thus, it is moderate relationship between knowledge on noise hazard and HPDs use by 56.4%. It means increase in HPDs use were medium correlated with increase in knowledge on noise hazard by the trainee.

(c) Research Question 3

Is there any relationship between knowledge on hearing protection by the trainee towards and hearing protection used?

Table 4.5 illustrates that there is significant and high positive correlation towards HPDs used with r= 0.776, p<0.01, N=101. Thus, it is a strong relationship between knowledge on hearing protection and HPDs use by 77.6%. It means increase in HPDs use were highly correlated with increase in knowledge on hearing protection by the trainee.

(d) Research Question 4

Is there is a relationship between self-efficacy by the trainee towards and hearing protection used?

Table 4.5 illustrates that there is significant and medium positive correlation towards HPDs used with r= 0.612, p<0.01, N=101. Thus, it is moderate relationship

between self-efficacy and HPDs use by 61.2%. It means increase in HPDs use were highly correlated with increase in self-efficacy by the trainee.

4.8.2 Regression Analysis

(a) Research Question 5

Which variable is the most dominant among risk perception, knowledge on noise hazard, knowledge on hearing protection, self-efficacy towards HPDs used?

The multiple regression result analysis shows the risk perception was not significant in predicting HPDS used (β=-.234 at $p>0.05$). The second findings from multiple regression result analysis also shows the knowledge towards noise hazards was not significant in predicting HPDS used (β=-.069 at $p>0.05$). The third findings from multiple regression result analysis also shows the self-efficacy was not significant in predicting HPDS used (β=-1.122 at $p>0.05$).

However, multiple regression result analysis shows that knowledge on hearing protection was significant in predicting HPDs used (β=1.256 at $p<0.05$). Therefore, the research question 5 knowledge on hearing protection is the most dominant and the only significant independent variable which explains the variance in HPDs use.

From this analysis we can assume that other than predictor of knowledge on hearing protection, the three other predictors do not significantly contribute to HPDs use and only knowledge on hearing protection is statistically most significant and influential towards the dependent variable.

4.9 Summary

This chapter explained the results from data collected through questionnaires. Beginning from introduction, the response rate and respondent's demographic were reported. The chapter then continued with reliability analysis, descriptive analysis, Pearson correlation and multiple regression. The next chapter presented the discussions on the findings, theoretical and practical implications, contributions, and the limitations in this study and suggestion for future research.

Table 4. 6

Research question results

Research questions	Result
RQ1: Is there any relationship between risk perception of the trainee towards hearing protection used?	Significant and low positive correlation Relationship is weak
RQ2: Is there any relationship between knowledge on noise hazards of the trainee towards and hearing protection used?	Significant and medium positive correlation Relationship is moderate
RQ3: Is there any relationship between knowledge on hearing protection by the trainee towards and hearing protection used?	Significant and high positive correlation Relationship is strong
RQ4: Is there any relationship between self-efficacy by the trainee towards and hearing protection used?	Significant and medium positive correlation Relationship is moderate
RQ5: Is there at least one most influential variable between all independent variable influence HPDS used?	Knowledge on Hearing Protection shows most significant

CHAPTER5

DISCUSSION, RECOMMENDATION AND CONCLUSION

5.0 Introduction

This chapter discussed about results and findings reported in Chapter 4 and whether the objectives of the study were fulfilled. The discussion continued with the implications in this study. The chapter also highlighted the limitations faced during this study, recommendation for future research and conclusion at the end of this chapter.

5.1 Discussion

Pearson correlation results on Table 4.5 has shown the overall conclusion of the study where correlations between all independent variables and dependent variable show significant values between low to high positive correlation.

(a) Research objective I:

To examine the relationship between hearing protection used and risk perception.

Itwas shown in Table 4.5 that risk perception was positively and significantly correlated with HPDs use with Pearson Correlation value of r=0.403 which showed a low correlation between the IV and DV. This result proves the empirical study by Arezes (2005) that suggested the use of hearing protection was based on their perceived level risk. However from this study, only 40.3% factor from risk perception was related to the HPDs use. Hence the research objective number one has been found satisfactory through this result of the research.

As per previous studies have concluded that individual worker perception are significant predictors of safety behavior as well as HPDs use (Arezes & Miguel, 2005). This lowest correlation can be interpreted as that student are not exactly aware of the risk they are exposed to. Although there is a need to use HPDs in all the analyzed workplaces, some of the students see their workplaces as not significantly dangerous, therefore, a place where it is not necessary to use HPDs. This research showed the consistency of the result and findings on other authors made by Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed risk perception had strong correlation towards HPDs use.

(b) Research objective II:

To examine the relationship between student's level of knowledge on Noise hazard and hearing protection used.

Knowledge on noise hazards is also positively correlated with HPDs use with the Pearson correlation value of r=0.56 is a medium correlation and significant. It can be concluded that there is connection about 50.6% of knowledge on noise hazards towards HPDs used. Hence the Pearson correlation showed medium positive correlation. This result concludes the empirical study by Afiah (2017) that knowledge training will increase likelihood in satisfactory knowledge on noise hazards and increase likelihood to practice wearing the HPDs during work to prevent NIHL. Hence the research objective number two has been found satisfactory through this result of the research.

Training can lead to a better knowledge of noise exposure risk but it will not necessarily lead to the same increase in the use of HPDs. This result is very important

considering that companies must become conscious that workers' training is not, per se, enough to increase their HPDs utilization rate. The results obtained seem to demonstrate that training should be tailored be specifically oriented to increase the use of HPDs. As per previous studies have concluded that knowledge on noise hazards are significant predictors of HPDs use where the consistency of the result and findings on other authors made by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed knowledge on noise hazard had strong correlation towards HPDs use.

(c) Research objective III:

To examine the relationship between student's level of knowledge on hearing protection and hearing protection used.

There is high positive correlation between knowledge on hearing protection with HPDs use where the Pearson correlation value is 0.776 and it is significant. This concludes that there is connection about 77.6% of knowledge on hearing protection towards HPDs used. Hence the Pearson correlation showed highly positive correlation. This findings proves the empirical study made by Grau (2002) stating that sufficient training on hearing protection will cultivate the safety attitudes and safety behavior towards hearing protection device used. Hence the research objective number three has been found satisfactory through this result of the research.

The result showed that most of the student were current with awareness on proper fitting and use of hearing protection device. This shows that sufficient training on the student has been delivered while they were in training class. As per previous studies had showed that knowledge on hearing protection are significant predictors of

HPDs use therefore the result shows consistency on findings by other authors made by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed knowledge on hearing protection had strong correlation towards HPDs use.

(d) Research objective IV:

To examine the relationship between student's self-efficacy and hearing protection used.

The relationship between self-efficacy and HPDs used is significant and medium positive correlation with Pearson correlation value of 0.61. This concludes that there is medium connection about 61.2% factor of self-efficacy towards HPDs use. Hence the Pearson correlation showed medium positive correlation. This findings proves the empirical study where it was widely discussed by Lusk et.al (1994) and Purdy (2016) stating that self-efficacy is a strong predictor in HPDS used. Hence the research objective number four has been found satisfactory through this result of the research.

The role of self-efficacy in the use of HPDs was identified as being the main predictor for HPDs use. Therefore, HPDs use promotion is more effective if focused on students' self-efficacy rather than on other types of interventions, such as enforcement of HPDs use. As per previous studies have concluded that self-efficacy are significant predictors of HPDs use where the consistency of the result and findings on other authors made by Arezes & Miguel (2005), Arezes et.al (2006), Purdy (2005), Thepakson et. Al (2017), Neitzel and Seixas (2005) and Lusk et.al (1996) showed self-efficacy had strong correlation towards HPDs use.

(e) Research objective V:

To examine the most influential variable between risk perception, knowledge on noise hazard, knowledge on hearing protection, self-efficacy towards HPDs used.

Through analysis in multiple regression, the most influential independent variables towards HPDs use is a knowledge in hearing protection with standardized coefficient value of β=1.256 at $p<0.05$. The value of R square for all independent variables is R^2=0.677. It means all variable have influence the dependent variable about 67.7% of variance in HPDs use.

This finding is found to be contradicted with study made by Arezes (2005) where the most influential predictors among all variables towards HPDs use is self-efficacy. The R square result found to be acceptable considering other author's result where they found the R square value was less than 50% by Rabinowitz et al.,(1996) and Lusk et al., (1994). Hence the research objective number five has been found satisfactory through this result of the research.

5.2 Implications

The implications of the findings will be discussed in two section which is from theoretical implication and practical implications.

5.2.1 Theoretical Implication

This research was done to examine the influence of risk perception, knowledge and self-efficacy with safety behavior particularly in the use of personal protective equipment (PPE). PPE use in this context was HPDs use. Many similar studies have

been performed by the researcher to investigate the usage of hearing protection devices among the workers especially those involved in noisy environment of the workplace. Therefore, this study has been focused on aviation maintenance industries as it is one of sector require serious attention toward PPE usage particularly in preventing noise induced hearing loss through the use of hearing protection device.

This study would be beneficial to future research as lack of empirical literature in investigating HPDs used in aviation industry. Theoretically, the findings of this study shows that any aviation maintenance company or aviation training school should emphasis on safety training to cultivate the safety culture particularly in proper usage personal protective equipment (PPE).

Risk perception, knowledge and self-efficacy could be cultivated by continues safety training among staff and trainee. These findings could help the researcher in further improve the safety and health management among staff and trainee and safe guard them from NIHL and promote the use of HPDs.

5.2.2 Practical Implications

Safety behavior such as in this context of research is HPDs use is an important dependent variable as it should be practice in the organization. Therefore, organization or training institution are expected to continuously encourage the employees or trainee for safety compliance such as wearing PPE.

The findings on this study will suggest and highlight the importance of risk perception, knowledge and self-efficacy towards HPDs use. Four antecedents have been proven could increase the HPDS use among the trainee which were risk perception, knowledge on noise hazard, knowledge on hearing protection and self-

efficacy. Thus, employers should emphasize these four variables in their company to cultivate the safety culture on usage of PPE.

The first variable is risk perception. The results of present research show that risk perception can predict the HPDs use. The risk perception is interpretation of the world and it is cultivated through experience or belief encountered by the students either throughout the theoretical training or practical training (Rohrmann, 2008). The employer or management of training institution should develop the safety culture in the workplace as it can improve the risk perception among students since they were in the beginning of the training.

The second and third variables are knowledge on noise hazard and knowledge on hearing protection. The findings on this study shows that knowledge on noise hazard and hearing protection could predict the HPDs use. The management of training institution should emphasize the training on noise hazard and its implication towards NIHL.

The knowledge training on PPE particularly on hearing protection devices should be emphasized in both theoretical and practical aspects. The training to understand the reason of wearing the HPDs also should be emphasize regularly to increase motivation and awareness of the worker toward HPDs used and preventing NIHL.

The fourth variable is self-efficacy. The findings on this research indicate that self-efficacy could predict the HPDs use among the trainee. Self-efficacy could be developed by learning through observation and social experience (Bandura, 1994). The management of training institution should develop a program to simulate training

related to HPDs awareness in order to expose the student with experience in industrial environment, for example wearing different kind of HPDs during practical in noisy environment. According to Bandura (1994), experience is the most important factor in self-efficacy.

5.3 Limitations

This research paper was prepared to fulfill the requirement of Master of Science Occupational Safety and Health Management project paper, therefore the time given was only for two semester to complete the project paper. This study utilized self-reported questionnaires to gather data on the independent and dependent variables. A study made by Arezes (2005) in previous literature has taken both self-report approach and observational approach for HPDs used.

5.4 Suggestion for Future Research

Hearing conservation program is managed to protect workers from constant noise exposures from the workplace even though the worker was exposed on that noise over their entire working career. To monitor employee's hearing over time, audiometric testing is used. It is an obligatory to the worker to carry out audiometric testing program including baseline audiograms, annual audiograms, and follow up audiograms. This helps the worker to measure his or her own hearing performance and monitor any development of NIHL. Therefore, audiometric testing program could be one of the independent variables for future research in predicting HPDS used to prevent NIHL.

Use of hearing protector as well is part of hearing conservation program where employers should provide HPDS to all workers which exposed to 8-hour TWA noise

level 85dB or above and employee's obligation to wear the HPDS all the time during noise exposure. HPDs issued must be adequately reduce the intensity of noise to suitable working environment. Besides, it is obligatory for the employer to revise the suitability of hearing protectors being issued from time to time. Hence, hearing conservation program is a well-structured and recognize program in order to protect the employees who exposed to high level noise in conserving their hearing and preventing from occupational work-related disease such as NIHL. Therefore, the implementation of hearing conservation program in the workplace could be one of predictors in determining the effectiveness of HPDs use.

5.5 Conclusion

The result and findings of this study demonstrated the reliability and validity of all independent variables risk perception, knowledge on noise hazard, knowledge on hearing protection and self-efficacy toward safety behavior particularly in HPDs use among trainee of aircraft maintenance in aviation industry. The study highlighted and stated that all the independent variables were an important factor toward HPDs use in a way to prevent occupational disease of noise induced hearing loss (NIHL). These factors were proven in this research able to minimize the risk of NIHL through regularly fitted of HPDs during work. This study would be beneficial to those involved in academic researcher related to noise, aviation industrial worker, students as well as safety practitioners is occupational safety and management to identify the mechanism in improving the safety in a workplace.

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